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PROGRESS REPORT

CONTRACT: NAS 9-13298

JULY - SEPTEMBER, 1973

RONALD W. MARRS

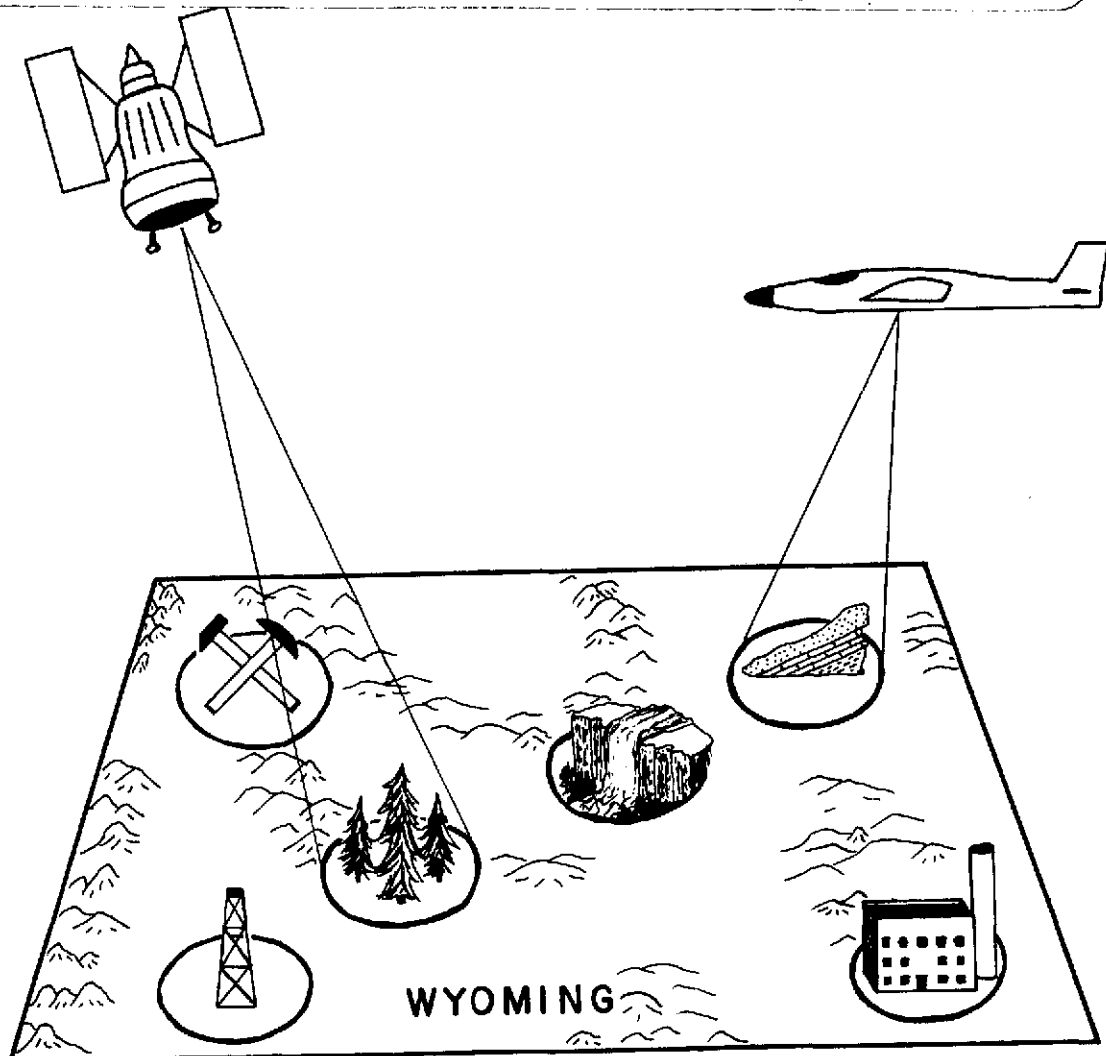
(E73-11136) MULTIDISCIPLINARY STUDY OF
WYOMING TEST SITES Progress Report,
Jul. - Sep. 1973 (Wyoming Univ.) 9 p
HC \$3.00

N73-33291

CSSL 05B

Unclas

G3/13 01136



TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Multidisciplinary Study of Wyoming Test Sites-- Progress Report		5. Report Date October 10, 1973	
7. Author(s) Ronald W. Marrs		8. Performing Organization Report No. ERP-1-73	
9. Performing Organization Name and Address Department of Geology University of Wyoming Laramie, Wyoming 82070		10. Work Unit No.	
12. Sponsoring Agency Name and Address Johnson Spacecraft Center Houston, Texas Technical Monitor: Martin L. Miller		11. Contract or Grant No. NAS 9-13298	
15. Supplementary Notes		13. Type of Report and Period Covered Progress Report July-September, 1973	
14. Sponsoring Agency Code			
16. Abstract Evaluations of ERP S-190 and S-192 imagery of northwest Wyoming have begun with applications in structural geology, geomorphology, vegetation mapping and land-use studies. Comparisons between S-190A photography and ERTS-1 70 mm imagery reveal that the S-190 data has superior spatial resolution but lacks tonal fidelity. Preliminary tests with the S-192 screening film indicate the brightness resolution of the S-192 scanner will prove adequate for the proposed applications.			
17. Key Words (Selected by Author(s)) ERP 190 A/B, 192 First-look		18. Distribution Statement	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages	22. Price*

*For sale by the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

Figure 2. Technical Report Standard Title Page

MULTIDISCIPLINARY STUDY OF WYOMING TEST SITES

Ronald W. Marrs
Department of Geology
University of Wyoming
Laramie, Wyoming 82071

September, 1973

Progress Report for July-August, 1973

Prepared For:

JOHNSON SPACECRAFT CENTER

HOUSTON, TEXAS 77058

WORK SUMMARY

The Wyoming EREP investigation picked up momentum as investigators began their evaluations with the Skylab II S-190 photography. Thus far we have received only the black-and-white, 70 mm, S 190A positive transparencies and the 5-in., S-190B contact duplicates from EREP passes 6 and 10, both of which traversed portions of northeast Wyoming. Pass 6 obtained cloud free coverage of the Black Hills and northern Powder River Basin as it passed across the extreme NE corner of Wyoming. Pass 10 obtained coverage of portions of Yellowstone Park, the Bighorn Basin, and the Powder River Basin. Most of the Bighorn Mountains and parts of the basins were cloud-covered during this pass.

After initial examination of the S-190 photography we are much enthused by the excellent resolution that is apparent on the green- and red-band images. Under magnification even the smaller fields are well resolved and farm yards one acre in size, or perhaps smaller, are distinguishable.

Several geologic formations, too thin to be recognized on ERTS-1 imagery were readily traced on the EREP 190A photography. This immediately precipitated several other comparisons between the ERTS-1 70 mm imagery and the S-190A transparencies. One of these early comparisons involved color-additive display of a false-color infrared rendition of the western Powder River Basin and Bighorn Mountains. To our amazement, the ERTS-1 image was generally superior in the color composite mode. The inherently better resolution of the EREP color composite was degraded both by the addition of the relatively grainy infrared film positive into the composite and by the limited resolution capability of the color-additive viewer. Furthermore, the EREP color composite image displayed mottled color patterns which are, apparently, unrelated to the imaged scene while the ERTS MSS color composite resulted in a uniformly colored

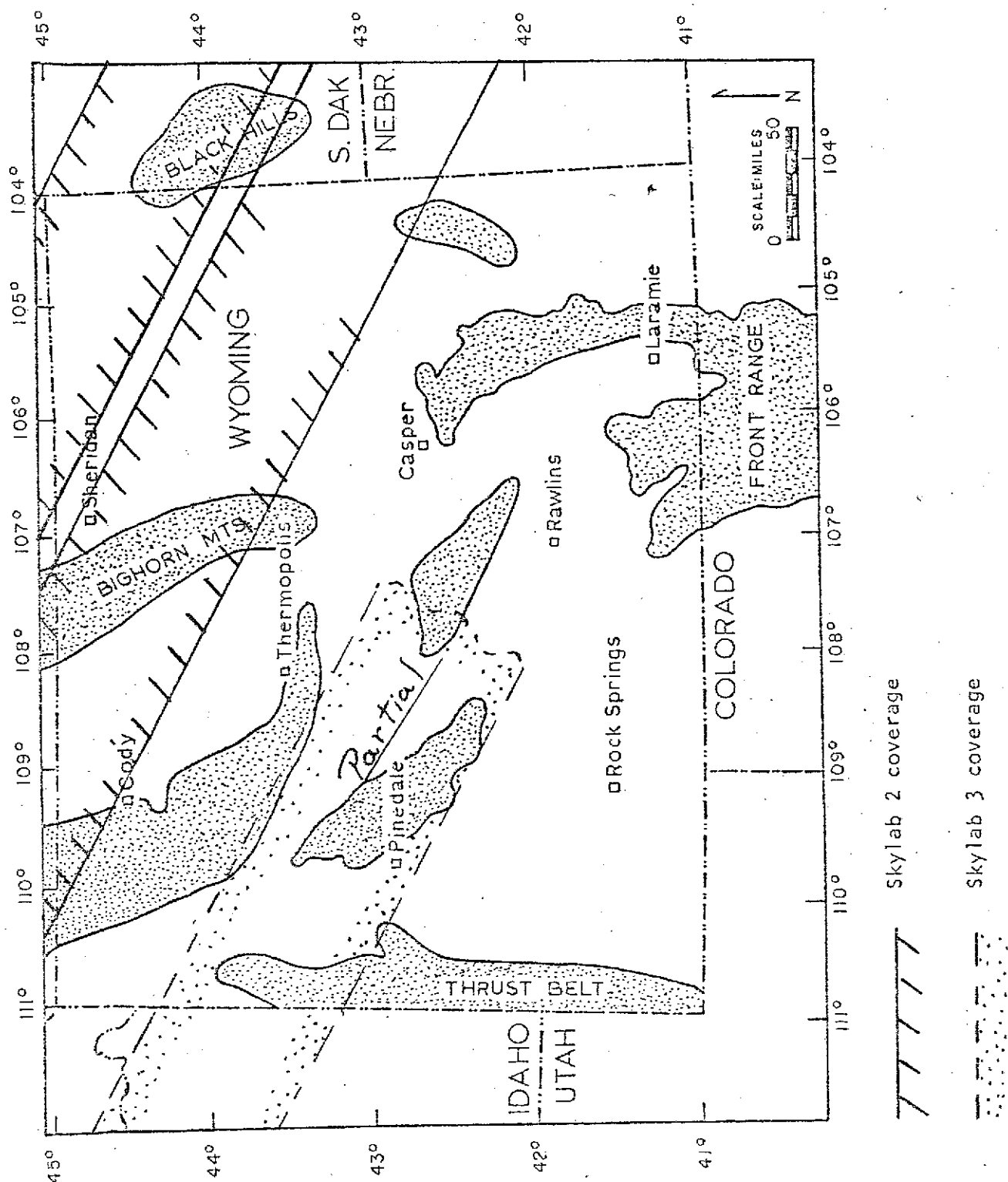


Figure 1. Index map showing coverage obtained during Skylab 2 and that anticipated from Skylab 3.

display as a result of greater fidelity of the image density patterns.

The general lack of radiometric fidelity indicated by this simple test is particularly disconcerting because the major applications of the S-190A multispectral photography are dependent on correct interpretation of radiometric variations.

We do, of course, realize that the EREP S-192 imagery should provide radiometrically reliable information and our initial tests, in which we have displayed the MSS-192 screening strips in a color additive mode indicate that the scanner data can supply the necessary radiometric fidelity and, with cooperation from the NASA data processing facility (NDPF) can be displayed color-additively in the proper ratios to enhance almost any spectrally unique feature. Consequently, the S-191 black and white photography is largely redundant within the pass strip covered by both the S-190 and S-192 systems. However, the spacial resolution of the S-190 photographs is undoubtedly superior to that of the S-192 screening film.

Interpretations of the EREP imagery have not yet been completed, but we have begun geologic, geomorphic and vegetative analysis of the Powder River Basin imagery and have requested specific S-192 band-combinations to aid us in this work. We anticipate that the requested MSS products and the color S-190 photography will be available in the next few weeks. We have continued gathering field calibration and spectral reflectance data in conjunction with the Skylab 3, EREP overpasses. These data together with reflectance data gathered during field checks were the basis of our S-192 band-combination selections. The bulk of the selected band combinations are band-ratios selected for specific feature enhancement. At present, the band-ratios are not a standard product of the NDPF and we anticipate some delay in obtaining the

important test areas while allowing a unique opportunity for evaluation of snow-enhancement on high-resolution satellite-imagery.

SIGNIFICANT RESULTS

Comparisons between ERTS and EREP 70 mm images revealed that the EREP S-190A imagery is superior to ERTS in spacial resolution but lacks tonal fidelity. However tests of the S-192 screening film indicate that it will provide the necessary tonal fidelity for color-additive work. No resolution comparisons were made with the S-192 imagery because the screening film, the only S-192 data currently available, does not represent an optimum quality product.

Correlative ground truth data and aircraft imagery have been gathered for each of the EREP data passes. These data will not only serve as a primary means of calibrating EREP data and checking interpretations, but also aid in making decisions about optimum band combinations for S-190A and S-192.

PROBLEMS AND RECOMMENDATIONS

The Wyoming EREP investigation has encountered two significant problems -- both of which have combined to delay the investigation.

A short delay in the initial launch of the Skylab 2 Mission and technical problems with the satellite (which resulted in the loss of several excellent EREP opportunities while crew members were engaged in repair operations) combined with unfavorable weather conditions to limit successful EREP passes to two during Skylab Mission 2.

During Skylab Mission 3 we were similarly unfortunate in that scheduling of crew days off, foul weather, and unscheduled cancellation of EREP passes for observation of solar flares resulted in a net output of one partially successful

EREP (≈ 30% success on Track 62) over Wyoming. Consequently the total coverage from the Skylab satellite fell far short of our expectations, and has necessitated a request for Skylab 4 EREP imagery.

Delay resulting from coverage limitations imposed by the relatively low success ratio for EREP data passes has been further compounded by delayed receipt of data products from NDPF.

As mentioned earlier, we have only part of the S-190 photography and S-192 screening film from Skylab Mission 2. We have no color S-190A photography, no enlargements, no S-191 data, and no digital S-192 data or S-192 image composites. This, plus the very limited coverage of the available data, has forced most of the Wyoming investigators to postpone their work until such time as the proper data is available.

The delayed start of many phases of the Wyoming investigation has produced a corresponding delay in progress and in budgeted expenditures. The Wyoming EREP investigation has continued at a reduced level of activity since March, 1973 and has accumulated a considerable budget surplus. However, the work defined by the proposal and contract will eventually require the investigators' time and the budgeted funds.

SUMMARY OUTLOOK

The overall quality of the EREP 190 and 192 imagery has been encouraging and we anticipate successful completion of most investigative objectives. As appropriate data products become available, we will increase the level of investigative activity and, hopefully, we will be able to compensate for some of the time lost in the earlier part of the investigation.

Investigators are now employing the available S-190 photography in geologic, geomorphic, vegetative and land-use analysis in the Big Horn Mountains and Powder River Basin. We expect some results from the investigations in the next two months.

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